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Nr. 8. Johs. Schmidt: ON THE LARVAL AND POST-LARVAL STAGES OF THE TORSK (*BROSMIUS BROSME* [ASCAN.]). (WITH 1 PLATE)

KØBENHAVN
I KOMMISSION HOS C. A. REITZEL
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ON THE LARVAL AND POST-LARVAL STAGES OF THE TORSK

(*BROSMIUS BROSME* [ASCAN.])

BY

JOHS. SCHMIDT

(WITH 1 PLATE)

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The knowledge we possess up to the present regarding the development of the torsk in the youngest stages is restricted to a treatise by Mc Intosh, published in 1892[1]. In the present paper a description is given of some fertilised eggs of a torsk, which were sent from the Shetland Isles on May 25th and also of the hatched larvae, which were kept living for about a week after the hatching took place, namely, until the yolk was almost absorbed. Later stages of pelagic torsk young have hitherto been unknown.

On the cruises with the Danish Research-Steamer "Thor" to Iceland and the Færoe Isles in 1904, I caught ca. 50 older and younger post-larval stages of a gadoid of a length of 0·7—6 cm., which soon proved to belong to the torsk. Moreover I have taken pelagic eggs of the torsk on the cruise in 1904 as well as in 1903 at several places by tow-netting; these eggs are very easily recognisable by the pinkish oil-globule mentioned and figured by Mc Intosh. Onboard the "Thor" I have on various occasions hatched such eggs, the larvae of which were kept alive, until the yolk was absorbed. From the larvae hatched from pelagic eggs onboard to the smallest post-larval stages caught in the sea, there is the most complete transition and accordance; the youngest post-larval stages also show such an unbroken developmental series from the youngest post-larval stages to the oldest, which only differ little from the fullgrown torsk, that the post-larval development of this fish is made quite clear from the material at hand from Iceland and the Færoe Isles.

In the following I shall first of all give a description of the development. The necessary verification of the determinations will then follow together with some remarks on the distinction between the fry of the torsk and that of related species, and finally a list will be given showing the "Thor"'s captures of pelagic post-larval torsk at the Færoe Isles and Iceland in 1904.

1. Description of the developmental history

To enter into a detailed description of the larval development will be superfluous, as this has been fully described by Mc Intosh (l. c.). For this reason I shall but briefly mention the development of the pigment in the three larval stages, which I have figured on Pl. I. These were all hatched onboard the "Thor" from eggs with pinkish oil-globule, which were taken at the surface off the south coast of Iceland at the end of May 1904.

A. Larval stages

Length: 3·95 mm. (Fig. 1). The yolk-sac is large and the mouth closed. The pink oil-globule may be seen in the yolk-sac. The eyes have very little pigment. A few branched chromatophores appear on the occiput as also on the dorsal wall of the abdominal cavity and on the trunk above

[1] IV. Contributions to the life-histories and development of the food and other fishes: Tenth Annual Report of the Fishery Board for Scotland Part III, p. 228—292. 7. On the eggs of the Torsk or Tusk, pl. XV fig. 8—14, pl. XVI fig. 19—21. 1892.

this. Whilst the pre-anal pigment thus consists of 2 transverse bars (the one is the occipital pigment, the other the trunk-pigment above the abdominal cavity) the post-anal pigment consists of 3 short transverse bars as in many other Gadoids etc. The most posterior of the three post-anal transverse bars is situated on the tip of the tail, the two others between this and the end of the gut. For the sake of brevity I shall call the hindmost bar: 1, the intermediate: 2, and the foremost: 3, while the two pre-anal bars are called: 4 (the one above the abdominal cavity) and: 5 (the occipital pigment). Of the three post-anal bars, No. 3, which lies in front of the middle of the post-anal part of the body, is the most conspicuous. Bar No. 2, which lies behind the middle of the post-anal part of the body, is fainter. Bar No. 1 is not restricted to the tip of the tail, but also extends on to the embryonic fin. This like the yolk-sac is of a minutely vesicular structure.

Length: 4·3 mm. (Fig. 2). The yolk-sac is considerably reduced. The mouth is still closed, and the end of the gut is still far from having reached the margin of the embryonic fin. The eyes have a little more pigment, but are still far from being quite black. The marginal fin has embryonic rays in the region of the caudal fin. With regard to the pigment I need only remark, that bar 2 is more conspicuous than previously; otherwise it is in the main as in the previously described stage.

Length: 5 mm. (Fig. 3). This stage is considerably more advanced in development than the preceding one. The yolk-sac is almost quite absorbed. The mouth is open, and the eyes are completely black (in living state blue). The end of the gut has not yet reached the margin of the embryonic fin. The pigment bar 1 is very conspicuous and large and the pigment is fan-shaped or radiate (arranged radially over the end of the embryonic fin along the embryonic rays). The ventral part of bar 2 also extends a little over the marginal fin. The bar 2 is the faintest of the post-anal bars.

This stage, which is just between the larval and post-larval stage, is one of the oldest of those artificially hatched. All the subsequent ones have been taken in the sea with the pelagic young-fish trawl.

B. Post-larval and young stages

Length: 6·84 mm. (Fig. 4). The same three post-anal pigment bars are present as before, and they are all (bar 2 included) conspicuous. Bar 1 consists chiefly of stellate chromatophores on the marginal fin. On the head there are but few chromatophores just as on the trunk above the pectorals. The ventral region has large stellate chromatophores, and pigment also appears on the dorsal wall of the abdominal cavity. Finally some black points appear along the edge of the lower jaw. The pectorals are fan-shaped flaps without any trace of rays. The ventrals are most peculiar and show prolongations in process of development. They consist of 3 almost free rays, of which the longest is already about double the length of the diameter of the eye; the middlemost of the three rays is shorter than the others, pointed and without pigment; the two others have on the contrary black pigment on the tip. The end of the gut, which is open, has almost reached the margin of the median fin. The mouth is unnaturally wide open in the present specimen, which is the only one I possess of this stage, showing the rudimentary elongation of the ventral fins.

Traces of developing rays and interspinous bones are still quite wanting.

Length: 10·95 mm. (Fig. 5). The distance from the tip of the snout to the anus is 3·95 mm. The snout is exceedingly short and rounded. The trunk is very elongated, the end of the gut is situated on the margin of the fin. The free tip of the notochord is quite straight. The embryonic median fin is continually very broad. Traces of developing interspinous bones can be noticed in the caudal fin as opaque, but not very distinctly limited, parts on both sides of the notochord, but rays have

not yet begun to develop. A sign of developing interspinous bones also appears in each of the dorsal and anal fins as an exceedingly low fold, which posteriorly extends a little behind the pigment bar 2. The ventral fins are now much longer than in the preceding stage. They still consist of three free rays, of which the middlemost is a little shorter than the others. The longest ventral rays measure a little more than $3^3/_4$ mm., or about as long as the distance from the tip of the snout to the vent. The elongated parts of the ventral fins have the form of very lengthy narrow bands, which are somewhat widened towards the tip, and consist besides the fin-ray of a narrow skin-wing on both sides of this. The elongated ventral rays have very conspicuous black pigment on their distal part. A little pigment also appears on the proximal part of the outermost of the three rays. The pigmentation of the trunk remains essentially as before, both in front of and behind the vent, where the same three short transverse bars appear as formerly.

Length: 12·51 mm. (Fig. 6). This stage is very much like the preceding one. The tip of the notochord is still quite straight. The first faint traces of rays may now be seen above and below in the caudal fin. The fold, from which the interspinous bones of the dorsal and anal fin develop, is more conspicuous than in the preceding stage, but as yet it is still very low. The longest ventral rays measure a little more than $4^1/_4$ mm. or about as much as the distance from the tip of the snout to the vent (this distance measures 4·47 mm). The outermost and innermost ventral rays are a little longer than the central one. All three elongated rays have very distinct pigment on their distal part, the proximal part of the outermost has also a little pigment. Besides the three elongated rays a fourth very short one may now be noticed on the inner side of the innermost of the elongated rays.

The pigment of the trunk remains essentially as before. Pigment bar 2 is now more conspicuous than 3.

Length: 14 mm. (Fig. 7). A considerable increase in bulk together with other great changes has taken place since the stage previously described. The free tip of the notochord now bends a little upwards. Developing rays may be noticed all over the caudal fin with the exception of a rather narrow part on both sides of the free tip of the notochord. The dorsal and anal fins also show traces of developing rays, which however are still faint in the anterior part of the fins. We can now count about 60 developing rays in the dorsal as well as in the anal fin; the caudal fin is still united with the dorsal and anal fin, but the shape of the interspinous bones distinctly marks where the caudal fin is beginning to form. The marginal fin is thick and shows a vesicular structure. In the fan-shaped pectorals about 18 developing rays can be counted. The three ventral rays still remain free and very elongated (the longest measure about 7 mm., or more than the distance from the tip of the snout to the vent, which measures ca. $6^1/_2$ mm.). The distal part of the ventral fins still has distinct black pigment, the pigmentation has however begun to move into the proximal part. The innermost (4^{th}) ray is more distinct than formerly, but still very short. On the trunk the same pigment bars appear as in earlier stages, but the pigment is proportionately fainter than before. Very little coloured pigment may be seen on the living young torsk of this (and other) size. The eyes are of a pale blue, and the sides of the ventral region are of a reddish hue. A very faint yellowish sheen is seen on the occiput and on the trunk at the black pigment-bars. The elongated ventral fins have only black pigment (the reverse of *Molva molva*), which holds good for this as for all other stages.

Length: 21 mm. (Fig. 8). The caudal fin, which has 45 rays, is now separated from the dorsal and anal fin. The tip of the notochord is somewhat bent upwards, and its free part is smaller than the distance from its tip to the hindmost point of the caudal fin. Rays now appear everywhere in the dorsal and anal fin. In the first 97 rays were counted, in the latter 69.

The three outermost rays in the ventral fins are still exceedingly long (ca. 9 mm., or longer than the distance from the tip of the snout to the vent, which measures $8^4/_5$ mm.). Inside the 4th short inner ray a still shorter 5th ray now appears. The main part of the elongated ventral rays is free, yet we may distinctly notice, that a connecting membrane is developing at the base of the fin. The elongated ventral rays are, as before, highly pigmented towards the ends.

The two pigment bars 2 and 3 are still present, whilst bar 1 begins already at this size to be indistinct. The original bars excepted no superficial pigment appears on the trunk. The snout is very rounded and short, and in shape may almost be said to approach that of the *Anarrhichas*-species.

Length: 28 mm. (Fig. 9). The free tip of the notochord is highly reduced. In the caudal fin 47 rays were counted, in the dorsal 101, and in the anal fin 72. The ventral fins are still very elongated (the length of the longest ray measures ca. $10^1/_4$ mm., while the distance from the tip of the snout to the vent measures ca. 11 mm.). The three outer rays of the ventral-fins are still free in most of their length. The two inner rays are short. We still find the same three post-anal transverse bars as in earlier stages (the most posterior, 1, is faint). The dorsal ridge, especially in front is covered with small pigment points. The original bars 2 and 3 still form the most conspicuous part of the pigment.

Length: $37^1/_2$ mm. (Fig. 10). In the caudal fin 47 rays were counted, in the dorsal 99 and in the anal 72. The rays have already become difficult to count, as the greater part of the fins, a marginal zone excepted, is covered with a thick skin. The caudal fin is rounded and nearly oval. The length of the elongated ventral rays is not so striking as before. The third ray, which is the longest, measures ca. 12 mm. (the distance from the tip of the snout to the vent, is ca. $15^1/_2$ mm.) and reaches considerably behind the beginning of the anal fin. The three outermost (longest) rays have distinct black pigment except in their proximal region, where the rays are connected by a common membrane, which only leaves them free for about $^2/_3$ of their length. The two innermost rays have increased in length, the innermost but one (the 4th) measures ca. $6^3/_4$ mm., and the innermost (the 5th) is about half the length of this (the 4th).

The dorsal region has densely aggregated, but very minute, pigment-points. The most conspicuous pigment is still the original two anterior post-anal pigment bars (2 and 3). Near the reduced free part of the notochord we find a little pigment: the remainder of the bar 1. Otherwise the trunk behind the vent is without superficial pigment. A short barbel may already be easily detected.

Length: 42·5 mm. (Fig. 11). This stage resembles in several respects the preceding one, but the ventral fins are proportionately shorter, as the longest ray (the outermost but two) measures $11^1/_2$ mm. and only reaches a little behind the beginning of the anal fin (the distance from the tip of the snout to the vent measures here ca. 18 mm.). The length of the innermost ray but one measures ca. $7^1/_2$ mm., and the innermost is about half the length of this. Besides the dorsal region we find the greater part of the sides, especially the dorso-lateral region, covered with exceedingly fine, but very closely arranged, pigment points, whilst the original bars (2 and 3), which are still conspicuous, consist of large stellate chromatophores. The farthest back post-anal bar (1) consist chiefly of some pigment specks near the reduced tip of the notochord.

Length: 54 mm. (Fig. 12). This specimen, which is one of the largest of the 0-Group I have taken, resembles the full-grown torsk very much in shape. The snout is however more rounded and shorter, the diameter of the eyes being still considerably larger than the length of the snout. The greater part of the marginal fin is, as in the full-grown fish, covered with a thick skin. A distinct barbel is present. In the anal fin were counted 70, in the dorsal fin ca. 100 rays. The ventral fins are considerably reduced and do not now reach the vent. The outermost ray is the longest (ca. 8 mm.; the

distance from the tip of the snout to the end of the gut measures ca. 22½ mm.). The pigment on the ventral fins is much fainter than previously, and the rays are now bound by a membrane in the greater part of their length. As in the grown-up fish the tips of the three outer (the formerly elongated) rays are free, whilst the two inner are connected. The pectorals are large, but do not reach the vent; they are broad and rounded behind. The sides are covered with closely arranged, fine, greyish pigment-points, among which the renants of the two post-anal bars 2 and 3 may still be distinguished.

The eyes in the living state are blue, and the sides are of a faint yellow-greyishhue; thisalso holds good for the stages represented in fig. 8—11. Thus the post-larval torsk never obtains the silvery lustre, which distinguishes these stages in the other gadoids. In some of the oldest known stages (of a length of 5—6 cm.) the pigment on the sides already showed a tendency to gather into the transverse bands, which characterize the grown-up torsk.

2. Verification of the determinations

On the cruise with the "Thor" in 1904 to Iceland and the Færoe Isles I have examined the number of vertebrae and further the number of fin-rays in the dorsal and anal fins in a number of full-grown torsk which were caught on lines.

I obtained the following figures:

29 *Brosmius* from Iceland and the Færoe Isles:

Vertebrae without and with lower arches	Number of specimens investigated
19 + 45	5
20 + 44	3
20 + 45	9
20 + 46	9
21 + 44	3

11 *Brosmius* from Iceland:

Number of rays in dorsal	97	98	105	101	102	95	96	93	107	106	98
Number of rays in anal	71	69	71	71	68	69	71	66	77	73	67

By Krøyer (Danmarks Fiske, II. p. 215. 1843—45),
Lilljeborg (Sveriges och Norges Fiskar, II. p. 202. 1891) and
Smitt (Skandinaviens Fiskar, I. p. 562. 1892) the following figures are given:

Number of rays in dorsal	85—102 (Krøyer) 90—102 (Lilljeborg) 90—105 (Smitt)
Number of rays in anal	62—76 (Krøyer) 71—76 (Lilljeborg) 71—76 (Smitt)

According to the material at hand, it was not difficult to refer the described series of post-larval gadoids to the torsk, whose larval stages moreover were known from Mc Intosh's artificial fertilisation of torsk-eggs with the characteristic pinkish oil-globule. The youngest of the post-larval stages taken in the sea (those represented in fig. 4—6) correspond closely in every respect with the

larval stages, both in the appearance and arrangement of the pigment as in other characters. I also counted the number of vertebrae in a specimen of ca. 12½ mm. and found 20 + 45 vertebrae, thus, as will be seen, exactly the same figures, which I had found in the full-grown torsk[1]. As soon as traces of the interspinous bones may be noticed, as in fig. 6, it can be seen, that only one dorsal fin and one anal fin are present as in the torsk, and this becomes still more distinct, when the rays appear (fig. 7). In the following stages the shape and arrangement of the marginal fins made it evident, that they could only belong to the torsk with which the number ot vertebrae was also in perfect accordance. Finally the same three post-anal pigment bars might be detected from the oldest young stages undoubtedly belonging to the torsk down through the series of post-larval phases of development to the larval stages.

3. On the distinction between the fry of the torsk and that of related species

After becoming acquainted with the developmental history of the torsk, we see, that the majority of all the North European gadoids, except the *Gadus*-species, have elongated ventral rays in the postlarval stages. This holds good for the genera: *Molva, Onos, Raniceps* and *Brosmius.* (In *Phycis* it is a well-known fact, that the ventral rays remain elongated, even in the old full-grown fish).

It may be useful to make some remarks here on the distinction between the young stages of the torsk and those of other gadoids, so far as these are known[2].

The young torsk most resembles the young of the *Molva*-species (*M. molva* and *M. birkelange*). From these and all other North Atlantic forms they may however be easily distinguished as soon as the caudal, dorsal and anal fins have been formed (*Molva* has two dorsal fins like *Merluccius, Onos, Raniceps, Phycis, Haloporphyrus, Halargyreus, Antimora*).

In the younger stages they may resemble to a certain degree the young *Molva,* but they are however easily recognisable from these by their shorter and more rounded snout, and by their thicker, and more pigmented, black, elongated ventral rays, which in opposition to *Molva molva* are without yellow pigment, further, they are separated in almost their whole length. In *Molva molva* the hindmost post-anal pigment bar (No. 1) is also wanting; this is however present in *Molva birkelange,* as I shall mention more particularly later on in a description of the postlarval developmental history of the two *Molva*-species. From the *Onos*-species, so far as their developmental history is known, the young torsk may be recognised by the arrangement of the 3 post-anal pigment-bars and from the fact that the elongated ventral rays are free, and later on also by their want of silvery lustre. The young *Raniceps*, which have been described by Malm (1877) and by Mc Intosh (1897), and also have elongated ventral fins, are easily recognisable from the torsk, among other characters by the extraordinary size of the head. The postlarval *Phycis* like *Onos* have silvery lustre, and the elongated ventral rays are connected by a membrane. The postlarval stages of *Merluccius* are unknown. In the larval stages the torsk is easily recognizable from *Merluccius* by the arrangement of the pigment and the pink oil-globule; this latter also offers a distinguishing character from *Molva* and *Onos.*

Of the three other genera found in the North Atlantic within our investigation-area: *Halargyreus, Antimora* and *Haloporphyrus,* the fry is unknown. These three genera are all deep-sea-fishes.

[1] It should be pointed out here, that the number of vertebrae in the two *Molva*-species (*Molva molva* and *M. birkelange*), with which a confusion might perhaps be feared, is very different from that of the torsk according to my investigations.

[2] The post-larval stages of the species *Merluccius, Haloporphyrus, Antimora* and *Halargyreus* are unknown. As soon as the fins are formed, the young torsk may however be easily distinguished from the other North Atlantic gadoid genera.

On the occurrence of the post-larval stages of the torsk within the area investigated by the "Thor" (around Iceland and the Færoe Isles)

In the years 1903 and 1904 I have taken great quantities of eggs of the torsk at the Færoe Isles as well as at South and West Iceland. The post-larval fry were found at the following places:

List of localities where pelagic post-larval stages of the torsk have been caught by the "Thor"

"Thor" St. **150.** $^{18}/_{6}$ 1904. **65° 50′ N., 26° 53′ W.** (Denmark-Straits). Depth: 392 meters. Young-fish-trawl; 70 meters' wire out, 15 minutes.

1 *Brosmius* (length 6,84 mm.).

"Thor" St. **175.** $^{8}/_{7}$ 1904. **63° 32′ N., 21° 30′ W.** (S. Iceland). Depth: 110 meters. Young-fish-trawl; 110 meters' wire out.

2 *Brosmius* (length: 11,14 mm.).

"Thor" St. **180.** $^{10}/_{7}$ 1904. **61° 34′ N., 19° 05′ W.** (Atlantic S. of Iceland). Depth: 2160 meters. Young-fish-trawl; 1800 meters' wire out. 1 hour.

1 *Brosmius* (length: 39 mm.).

"Thor" St. **181.** $^{10}/_{7}$ 1904. **61° 34′ N., 18° 43′ W.** (Atlantic S. of Iceland). Depth: more than 1000 fathoms. Young-fish-trawl; 70 and 100 meters' wire out. 1 hour.

2 *Brosmius* (length: 38,39 mm.).

"Thor" St. **183.** $^{11}/_{7}$ 1904. **61° 30′ N., 17° 08′ W.** (Atlantic S. of Iceland). Depth: more than 1000 fathoms). Young-fish-trawl: 25 meters' wire out. 3 hours.

21 *Brosmius* (length: 32, 34, 35, 35, 36, 37·5, 40, 40, 40, 40, 41, 42, 42, 42, 43, 44, 44, 45, 46, 48, 50 mm.).

"Thor" St. **184.** $^{11}/_{7}$ 1904. **62° 42′ N., 18° 53′ W.** (S. of Iceland). Depth: 1340 meters. Young-fish-trawl; 25 meters' wire out. 1 hour.

1 *Brosmius* (length: 41 mm.).

"Thor" St. **188.** $^{12}/_{7}$ 1904. **63° 30′ N., 20° 14′ W.** (S. Iceland). Depth: 80 meters. Young-fish-trawl; 25 meters' wire out; 30 minutes.

1 *Brosmius* (length: 20 mm.).

"Thor" St. **189.** $^{14}/_{7}$ and $^{15}/_{7}$ 1904. **63° 30′ N., 21° 03′ W.** (S. Iceland). Depth: 90—109 meters. Young-fish-trawl; 50 and 100 meters' wire out; $5^{1}/_{2}$ hours.

3 *Brosmius* (length: 15, $19^{1}/_{2}$, 24 mm.).

"Thor" St. **190.** $^{14}/_{7}$ 1904. **63° 29′ N., 21° 25′ W.** (S. Iceland). Depth: 94—120 meters. Young-fish-trawl; 110 meters' wire out. 3 hours.

4 *Brosmius* (length: $17^{1}/_{2}$, 21, 25, 28 mm.).

"Thor" St. **209.** $^{21}/_{7}$ 1904. **66° 33′ N., 18° 10′ W.** (N. Iceland). Depth: 76 meters. Young-fish-trawl; 30 meters' wire out; 30 minutes.

1 *Brosmius* (length: 10·95 mm.).

Same locality. Young-fish-trawl; 10 meters wire out; 30 minutes.

1 *Brosmius* (length: 12 mm).

"Thor" S. **210**. $^{22}/_{7}$ 1904. **66° 43′ N., 18° 10′ W.** (N. Iceland). Depth: 400 meters. Young-fish-trawl; 10 meters' wire out; 30 minutes.

1 *Brosmius* (length: 12·51 mm.).

"Thor" St. **224**. $^{31}/_{7}$ 1904. **63° 40′ N., 10° 38′ W.** (Atlantic between Iceland and the Faroe Isles). Depth: 540 meters. Young-fish-trawl; 70 meters wire ont; 20 minutes.

3 *Brosmius* (length: 42·5, 53, 56 mm.).

"Thor" St. **282**. $^{31}/_{8}$ 1904. **63° 24·5′ N., 20° 03·5′ W.** (S. Iceland). Depth: 145 meters. Young-fish-trawl; 100 meters' wire out. $1^{1}/_{2}$ hour.

2 *Brosmius* (length: 54·58 mm.).

"Thor" St. **284**. $^{1}/_{9}$ 1904. **63° 11′ N., 20° 28′ W.** (S. Iceland). Depth: 224 meters. Young-fish-trawl; 250 meters' wire out. 2 hours.

1 *Brosmius* (length: ca. 55 mm.).

The hauls stated here show, that the post-larval fry of the torsk live a pelagic life, which is in accordance with the presence of very elongated ventral fins. All the specimens found, up to a length of ca. 6 cm., were taken pelagically at various depths; through the "Thor"s investigations it has been proved, that the older post-larval stages (of a length of 3—6 cm.) within the "Thor"s investigation-area, are to be found in greatest numbers near the surface in the open sea south of Iceland at depths of more than a thousand fms., together with the older fry of *Sebastes*, a pelagic *Nerophis*, a most peculiar, clumsy pelagic gadoid, which so far has not been described, the fry of Scopelini, and several others. The eggs and the very young post-larval fry, on the contrary, have hitherto been found in greatest numbers near the south coast of Iceland together with the very young fry of the ling (*Molva molva*). The bottom-stage of the 0-group of the torsk has so far not been taken in our hauls. It is on the whole so extraordinarily seldom, that the younger annual series of the torsk are brought up by the ordinary trawlings in shallow water (ca. 100 fms. and less) that we hardly err in supposing, that the torsk after the end of its pelagic life spends its first years in deeper water.

Corrigenda.

P. 3, L. 13 from above: *read:* . . . the post-larval stages also show such an unbroken developmental series from the youngest stages to the oldest . . .

P. 4, L. 4 from beneath: Instead of 3·95 mm., *read:* **3·75** mm.

P. 5, L. 16 from above: Instead of $4^{1}/_{4}$ mm., *read:* **$4^{1}/_{2}$** mm.

P. 7, L. 9 from above: Instead of . . . in *the* other gadoids . . ., *read:* . . . in other gadoids . . .

550 ^{28}/VIII 1905

Description of the plate

Torsk or Tusk (*Brosmius brosme* [Ascan])

Fig. 1—12

Fig. 1. Larva hatched onboard the "Thor". May 1904. South Iceland.
Length: 3·95 mm.

Fig. 2. Larva hatched onboard the "Thor". May 1904. South Iceland.
Length: 4·3 mm.

Fig. 3. Larva hatched onboard the "Thor". May 1904. South Iceland.
Length: 5 mm.

Fig. 4. Post-larval stage. "Thor". St. 150. June 18th 1904. West Iceland. 65° 50′ N., 26° 53′ W. Depth: 392 meters. Young-fish trawl; 70 meters' wire out.
Length: 6·84 mm.

Fig. 5. Post-larval stage. "Thor". St. 209. July 21st 1904. North Iceland. 66° 33′ N., 18° 10′ W. Depth: 76 meters. Young-fish trawl; 30 meters' wire out.
Length: 10·95 mm.

Fig. 6. Post-larval stage. "Thor". St. 210. July 22nd 1904. North Icelend. 66° 43′ N., 18° 10′ W. Depth: 400 meters. Young-fish trawl; 10 meters' wire out.
Length: 12·51 mm.

Fig. 7. Post-larval stage. "Thor". St. 175. July 8th 1904. South Iceland. 63° 32′ N., 21° 30′ W. Depth: 110 meters. Young-fish trawl; 110 meters' wire out.
Length: 14 mm.

Fig. 8. Post-larval stage. "Thor". St. 190. July 14th 1904. South Iceland. 63° 29′ N., 21° 25′ W. Depth: 94—120 meters. Young-fish trawl; 110 meters' wire out.
Length: 21 mm.

Fig. 9. Post-larval stage. Caught in the same haul as the specimen figured in fig. 8.
Length: 28 mm.

Fig. 10. Post-larval stage. "Thor". St. 183. July 11th 1904. North Atlantic off the Southern coast of Iceland. 61° 30′ N., 17° 08′ W. Depth: more than 1000 fathoms. Young-fish trawl; 25 meters' wire out.
Length: 37·5 mm.

Fig. 11 Post-larval stage. "Thor". St. 224. July 31st 1904. North Atlantic between the Færoe Isles and Iceland. 63° 40′ N., 10° 38′ W. Depth: 540 meters. Young-fish trawl; 70 meters' wire out.
Length: 42·5 mm.

Fig. 12. Young stage. "Thor". St. 282. August 31st 1904. South Iceland. 63° 24·5′ N., 20° 03·5′ W. Depth: 145 meters. Young-fish trawl; 100 meters' wire out.
Length: 54 mm.

Fig. 1—12 *Brosmius brosme* (Ascan).

TOME I

CONTENTS

Page

Nr. 1. C. G. Joh. Petersen: ON THE LARVAL AND POSTLARVAL STAGES OF THE LONG ROUGH DAB AND THE GENUS *PLEURONECTES*. (WITH 2 PLATES) ..... 1—13

Nr. 2. A. C. Johansen: CONTRIBUTIONS TO THE BIOLOGY OF THE PLAICE WITH SPECIAL REGARD TO THE DANISH PLAICE-FISHERY. I. (CONTAINING 12 PLATES) ..... 1—70

Nr. 3. Johs. Schmidt: ON PELAGIC POST-LARVAL HALIBUT (*HIPPOGLOSSUS VULGARIS* FLEM. AND *H. HIPPOGLOSSOÏDES* [WALB.]). (WITH 1 PLATE) ..... 1—13

Nr. 4. Johs. Schmidt: THE PELAGIC POST-LARVAL STAGES OF THE ATLANTIC SPECIES OF *GADUS*. A MONOGRAPH WITH 3 PLATES AND 16 FIGURES IN THE TEXT ..... 1—77

Nr. 5. C. G. Joh. Petersen: LARVAL EELS (*LEPTOCEPHALUS BREVIROSTRIS*) OF THE ATLANTIC COASTS OF EUROPE ..... 1—5

Nr. 6. A. C. Johansen: REMARKS ON THE LIFE HISTORY OF THE YOUNG POSTLARVAL EEL (*ANGUILLA VULGARIS* TURT.) ..... 1—9

Nr. 7. Adolf Severin Jensen: ON FISH-OTOLITHS IN THE BOTTOM-DEPOSITS OF THE SEA. I. OTOLITHS OF THE *GADUS*-SPECIES DEPOSITED IN THE POLAR DEEP ..... 1—14

Nr. 8. Johs. Schmidt: ON THE LARVAL AND POST-LARVAL STAGES OF THE TORSK (*BROSMIUS BROSME* [ASCAN.]). (WITH 1 PLATE) ..... 1—12